

The DLESE Community Review System: Gathering, Aggregating, and Disseminating User Feedback about the Effectiveness of Web-based Educational Resources

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ABSTRACT

The Community Review System (CRS) of the Digital Library for Earth System Education (DLESE) is intended to help educators seeking excellent and appropriate digital resources, and resource creators seeking recognition. The CRS gathers web-based feedback from educators and learners who have used DLESE educational resources, plus specialist reviews by science and pedagogy experts. This information is used to identify exemplary resources to be showcased in the DLESE Reviewed Collection. Detailed, but anonymous, feedback is provided to the resource creator to encourage improvement of the resource. To help potential users of the resource decide whether (and how) to use the resource, we also web-disseminate four kinds of aggregated information from the review process: Teaching Tips, recommendations about whether the resource is effective with specific learner populations, a graphic summary of the quantitative feedback from the community reviews, and an Editor's summary.

INTRODUCTION

The Digital Library for Earth System Education (DLESE) is a nationwide effort to find, create, document, disseminate, and provide support in using excellent digital resources for teaching and learning about the Earth. The DLESE Reviewed Collection contains educational resources which have been reviewed for scientific accuracy, pedagogical effectiveness, ease of use, clarity and completeness of documentation, ability to motivate learners, robustness, and significance of content. The Community Review System (CRS) is a pathway into the DLESE Reviewed Collection, which combines Web-mediated feedback from educators and learners who have used the resource and peer-review by specialists selected by an Editorial Review Board. The goals of the Community Review System are to:

- (1) identify excellent educational resources from within the DLESE Broad Collection and move them into the DLESE Reviewed Collection,
- (2) provide feedback from users to resource creators to allow creators to iteratively improve their resources, and
- (3) provide information for prospective users of DLESE resources, based on other users' experience, that will help them make informed decisions about whether to use the resource, and will help them use the resource more effectively.

This paper will first describe how the Community Review System gathers information about digital educational resources from users and specialists, then describe the confidential feedback that is provided to resource creators, and finally illustrate what information is publicly posted for users of the resource.

This paper's anticipated audience includes creators of DLESE resources and DLESE collections, users of DLESE, builders of other digital libraries, and academic administrators who are considering whether to give academic career recognition in promotion, tenure and hiring decisions for authors of educational resources admitted to the DLESE Reviewed Collection.

CONTEXT: ABOUT DLESE AND THE DLESE REVIEWED COLLECTION

About DLESE - The Digital Library for Earth System Education (DLESE; <http://www.dlese.org>) is designed to provide: (a) ready access to high-quality educational materials about the Earth and environment for use by educators and learners at all levels, (b) information, tools and services to maximize the usefulness of the materials provided; and (c) a community center that fosters interaction, collaboration and sharing among educators and learners. Development of the library is underway as a nation-wide distributed effort, overseen by the DLESE Steering Committee and coordinated through the DLESE Program Center at Boulder (DPC). The DLESE Community Review System, based at Lamont-Doherty Earth Observatory of Columbia University, represents one component of this distributed effort. DLESE, in turn, is one component of the National Science Digital Library (NSDL; www.nsl.org), which spans the science and engineering fields.

Among the digital library efforts, DLESE is notable for its emphasis on the importance of community (Marlino et al, 2001); indeed, its founding document (Manduca & Mogk, 2000) is subtitled "A Community Plan." In the DLESE vision, the community of library users is also the community of library builders--creating, gathering, and reviewing the resources, shaping the governing policies, and providing constant feedback into the development of the technical infrastructure. This community focus is in part a response to the research finding that systemic educational change requires large-scale, long-term community participation in and ownership of the process of change (AAAS, 2001; Rogers, 1995), and partly a result of the way in which DLESE has grown through a series of grass-roots workshops and planning sessions (NSF, 1996; NSF, 1997; Manduca & Mogk, 2000; DLESE, 2000; DLESE, 2001; DLESE, 2002).

ABOUT THE DLESE REVIEWED COLLECTION

DLESE's collections comprises a "Broad Collection" and a "Reviewed Collection." The rationale for maintaining the Broad Collection is to provide an extensive variety of resources, and to provide a forum in which resource users can provide feedback to help creators iteratively improve the quality of individual resources. To be included in the Broad Collection, a resource must meet minimum requirements for relevance to Earth System Education and basic functionality. The rationale for

How do reviewers find the review opportunity?

DLESE Reviewed Collection

Title	Take a Dip http://www.k12science.org/curriculum/dipproj/index.html	Contribute a Review
Resource description	This on-line project is part of the Center for Improved Engineering and Science Education (CIESE) program, which has developed internet activities for the elementary, middle, and high school level student. This project involves comparing the water quality of local rivers, streams, lakes or ponds with other fresh water sources around the world. The focus is to assess the quality of water based on physical characteristics and chemical substances, and to look for relationships and trends among the data collected by all participants. The project provides instructions, activities, data links, reference materials, on-line help, and a teacher area. [View More Information]	
Review completion date	(Review in progress)	
Review source	CRS (Community Review System)	

(a) from the DLESE Discovery System (above); (b) from a button on the resource (left); (c) from a list on the CRS website (below); and (d) from an email invitation (bottom).

CIESE Online Classroom Projects

- Home
- Project Information
- Project Instructions
- Project Data
- Student Area
- Teacher Area
- Reference Material
- Online Help

DLESE SUBMIT REVIEW

DLESE COMMUNITY REVIEW SYSTEM Digital Library for Earth System Education (DLESE) Community Review System (CRS)

Click on the resource titles to access the resources themselves. Click on the "Review Resource" buttons to access the system for contributing a review.

Resource Title	Contribute a Review
Mountain Simulation: Assignment	Review Resource
Fundamentals of Physical Geography	Review Resource
Remote Sensing Using Satellites	Review Resource
Grand Canyon Exercise	Review Resource
Geology of the Smith River: A Virtual Trip Through The Josephine Ophiolite	Review Resource

To DLESE Community Members:

The DLESE Community Review System (CRS) invites your reviews of the following new DLESE educational resources, which have been cataloged as containing content on the topic area of: *atmospheric science and/or climatology*.

ATMOSPHERE/CLIMATE (August 2003 update)

Resource Title: How to Convert Temperatures
 To see resource: http://avc.com.nsdlib.org/cgi-bin/wiki_grade_interface.pl?Converting_Temperatures
 To review resource: <http://crs.dlese.org/submit?id=DLESE-000-000-003-827>

Figure 1. Prospective community reviewers can find their way to the point at which they may submit reviews via any of four routes. (a) Within the DLESE Discovery System, the return for a resource in review comes up with a "Submit a Review" button, (b) Resource creators are invited to add a "DLESE! Submit a Review" button directly to their resources. (c) The Community Review System website includes a list of resources available for review. (d) Reviews are invited by email via the DLESE Community listserver. Each of these routes leads the reviewer directly to the first page of the review process for that specific resource, not to a general-purpose front page.

establishing a Reviewed Collection is to help library users find exemplary teaching and learning materials, and to help resource creators achieve academic career recognition. Inclusion in the Reviewed Collection of DLESE is intended to be analogous to publication in a peer-reviewed journal.

The DLESE Collections Committee has established seven criteria by which educational resources must be

evaluated for inclusion in the Reviewed Collection. They are:

- Scientific accuracy
- Importance or significance
- Pedagogical effectiveness
- Well-documented
- Ease of use for students and faculty
- Power to inspire or motivate students

- Robustness as a digital resource

These seven selection criteria have been fleshed out in Kastens et al (2003). There are several different pathways by which an educational resource or a collection of resources can be admitted to the DLESE Reviewed Collection, some aimed at specific audiences or resource types. A current list of pathways to the DLESE Reviewed Collection, with links to descriptions of each pathway's review procedures, is maintained at: <http://www.dlese.org/dds/histogram.do?group=subject&key=drc>

ACQUISITION OF FEEDBACK/REVIEWS

Overview - The CRS considers two sources of review information: first, "community reviews" gathered via the World Wide Web from educators and learners who have used the resource for teaching or learning, and second, specialist reviews by specialists selected by an Editorial Review Board. This combination of review strategies is intended to tap into the expertise and observations of the hundreds of front-line educators in the DLESE Community, and to honor DLESE's vision of "User as Contributor"--while at the same time ensuring that only the highest quality resources reach the Reviewed Collection. The rationale behind the Community Review System's hybrid review process was originally described in Kastens (2000) and Kastens & Butler (2001).

Eligibility - Only resources that are currently in the DLESE Broad Collection will be considered for review by the CRS. In the early days of the CRS, we required that the resource creator nominate his or her resource for CRS review, and then an editor examined each nominated resource to determine whether it was suitable for review by the CRS. We eventually realized that the CRS-reviewable resources were those that were cataloged as falling into certain learning resource types: classroom activities, computer activities, field activities, lab activities and similar pedagogically-oriented resources. Other DLESE learning resource types, such as portals and data sets, are not amenable for review with our criteria and rubrics. As of summer of 2004, we offer for CRS review any DLESE resource that falls within these learning resource types. Before opening a resource for review, we offer the resource creator an opportunity to opt-out of the review process.

The Community Review Phase - Potential community reviewers can enter the review process in any of four ways (figure 1). First, for some resources, reviewers can click on a "DLESE! Submit a Review" Button on the resource itself. (This button is generated by a one-line snippet of html code which we send to the resource creator when the resource is accepted for review. Whether to include this button is the resource creator's choice.) Secondly, reviewers may find a resource of interest available for review on an email alert of new resources circulated via the DLESE Community listserver. Thirdly, if a user finds a resource in review in the DLESE Discovery System (search engine), the return for that resource includes a "Submit a Review" button. Finally, the Community Review System website includes a list of resources. Each of these routes leads the reviewer directly to the first page of the review process for that specific resource, not to a general-purpose front page.

When they begin the review process, all users are now asked for their email address and full name. In the future, DLESE/NSDL is expected to have a registration and authentication system against which the identities of potential educator-reviewers could be checked. But at present, our check is to send a copy of the review back to the email address provided as the reviewer's address, to discourage malicious reviews sent under someone else's name. When we first opened the CRS, we collected names and email addresses only from those reviews which we intended to use for editorial decisions, which at the time, was only reviews from educators who had used the resource in their classroom or other learning context. Our reasoning was that asking for personal information erects a barrier to participation. But this initial decision was a mistake; the pathways which did not ask for name or email address attracted some pornographic and otherwise inappropriate comments. The current CRS policy of requiring all community reviewers to identify themselves parallels the policy of the successful MERLOT digital library (<http://www.merlot.org/>), where educators can obtain information without registering, but may not contribute information unless they register. Reviewers' identities are stored with the review, and are considered in editorial decisions, but are not revealed to the resource creator or to the public. The Columbia University Institutional Review Board on Human Subjects Research has approved our methodology for handling reviewers' personal information.

Community reviewers are asked whether they considered the resource "To Learn with" or "To Teach with," and are directed to different web forms depending on their answers. Reviewers who answer "To Teach with," are then asked whether they actually used the resource in their classroom or other learning context. For educators who looked at the resource themselves but decided not to try it in their classroom or other learning context, we ask a short set of questions, mostly focused on why they decided not to use the resource.

Educators and learners who used the resource to teach with or to learn with are directed to a longer, three-part survey. The first section of the survey (figure 2, upper) concerns the alignment of the resource with the DLESE Reviewed Collection selection criteria: robustness as a digital resource, scientific accuracy, documentation, ease of use for teachers and students, motivational/ inspirational for learners, and pedagogical effectiveness. Reviewers are invited to score the resource on one or more rubrics for each selection criterion. For example, one of the rubrics under "Motivational/ Inspirational for Learners" asks educators to rate the resource on "Generation of Interest and Attention" between a high score of 4 if "Interest was widespread and sustained throughout use of this resource" to a low score of 1 if "Learners were generally bored, inattentive, or restless while using this resource." Learners see different wording, cast in the first person: from a high score of 4 if "I was fascinated by this resource," to a low score of 1 if "I was bored by this resource."

The "To Teach With" track through the CRS community phases has been in operation since spring 2002. The "To Learn With" track has been active only since July 2003. Previously, we had a "non-educator's" track which offered only a free-text box in which users could send comments to resource creators. We did not use the "non-educator's" responses in our editorial

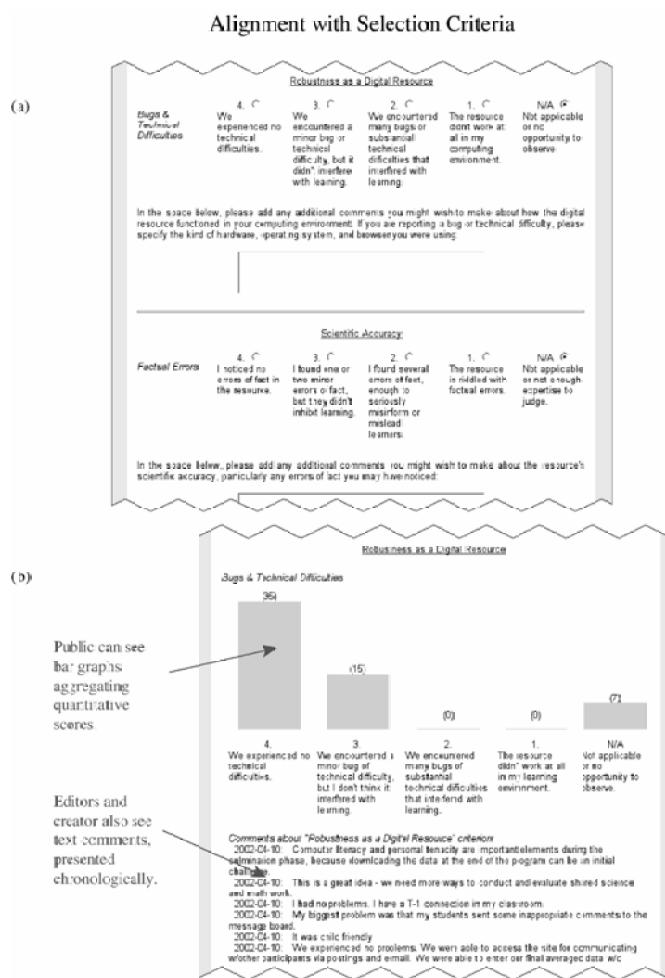


Figure 2. Educators and learners who have used a resource for teaching or learning score the resource on a set of rubrics addressing the selection criteria for admission to the DLESE Reviewed Collection. They also have the opportunity to write a text comment about how well the resource met each criterion. (upper) Part of the webform which gathers this information from educators. Learners see slightly different wording. (lower) We aggregate this information from multiple reviewers and display it for the benefit of the resource creator, the CRS editors, and prospective resource users.

decisions, nor make any part of them accessible to the public. Our goals in adding the "To Learn With" track were (a) to capitalize on the large numbers (Table 1) of reviewers who used the resources in some capacity other than as teachers, (b) to capture learners' perspectives, especially concerning the criteria of "ease of use" and "inspirational/motivational to students," and (c) to offer a viable review pathway for resources that are designed for outreach direct to learners, in contrast to lessons or activities that are designed for use by educators with their students. Examples are ReefBase: A Global Information System On Coral Reefs (<http://www.reefbase.org/>) and Internet Guide to International Fisheries Law (<http://www.oceanlaw.net/guide.htm>).

Number of Reviews Received	
Type of Review	Number of Reviews
Educator, used resource in classroom	113
Educator, did not use resource in classroom	52
"Non-educator" (category retired July 2003)	74
Learner (category initiated July 2003)	22
Total valid reviews	261

Table 1.

TRANSITION FROM COMMUNITY REVIEW TO SPECIALIST REVIEW STEP

To move from the community review step to the specialist review step, a resource must pass two thresholds: usage and quality.

Usage Threshold - One of the seven selection criteria for the DLESE Reviewed Collection is that the material to be taught or learned must be "significant or important." As a measure of this criterion, we use the willingness of educators and learners to invest their time in using the resource and submitting a review. Even if the review is not particularly positive, the fact that members of the DLESE community cared enough about the resource's targeted understanding or skill or knowledge to use the resource is an indicator that they consider the material to be of importance or significance. Therefore, the first threshold that a resource must pass to move from the community review phase to the specialist phase is that ten reviewers, of which at least three must be educators, must use and review the resource.

Quality Threshold - The quantitative scores from all of the community phase web rubrics are automatically aggregated into bar graphs, and mean scores are calculated (figure 2). The CRS Editor, currently myself, examines all of the scores and the text comments from community reviewers. We are looking for mean scores of 3 out of 4 or better on all of the rubrics, with no inexplicable outlying clusters of extremely negative scores or extremely negative comments. Outlying negative scores or comments are considered in the context of who sent the review, allowing for the possibility that the resource was being used for an audience for which it wasn't intended.

These thresholds are proving to be difficult for resources to meet. As of December, 2003, seven resources have passed from the community review step to the specialist review step. The usage of DLESE resources, at least as reflected in generation of CRS reviews, appears to be extremely uneven (Table 2). A handful of resources have attracted far and away the lion's share of the reviews.

Tips for Teaching and Learning

(a)

COMMUNITY REVIEW SYSTEM Digital Library for Earth System Education (DLESE) Community Review System (CRS)

YES I USED THE RESOURCE (PAGE 2 OF 3)

In the space below, please offer any teaching tips you might have for other educators using this resource. For example, have you found points in the activity where learners typically run into trouble, and have you found a way past these stumbling blocks? Your teaching tips will be posted in the library in association with the resource.

I found that many students weren't familiar with the geography of the field area. I put a map on the wall and encouraged them to refer to it.

Submit Clear

DLESE This site is under active development! Send comments to: Kit@Mastouh.com NSDL

(b)

Annotation: Teaching Tips

Title: Lake a Day

ID: DLESE-000-000-001-64C

Number of Teaching Tips Received: 3

From a teacher on 2012-06-20 working at the Middle school (6-8) level:
go for it - great fun while learning to perform science

From a teacher on 2012-07-01 working at the Middle school (6-8) level:
Due to the fact that I see my students only 45 minutes a day, any trip to the lake that we partnered with caused students to miss all other classes. I solved the problem this year by stopping by the lake on my way to school to collect water for chemical tests and stream mud for macro invertebrate surveys. I had to perform the dissolved oxygen test on-site immediately for accuracy. We had a couple of trips to the lake in addition where we combined water monitoring with projects such as painting the life cycle of a dragonfly on a building wall there. I am still searching for alternative solutions. Any suggestions would be welcomed.

From a teacher on 2012-10-21 working at the Intermediate elementary (6-5) level:
I found it difficult to keep 20+ students actively involved while taking the water tests. A solution I am going to try is to split the class in half. Friends from the local DNR will take the 10+ students out to do the testing and I will keep the other half in the class. We will then switch the next month.

Figure 3. Educators and learners who have used a resource for teaching or learning are asked to contribute tips for other educators or other learners who are using the resource. (upper) The webform which gathers this information from educators; learners see slightly different wording. The webform states that these tips will be made public. (lower) We display the tips for teaching or learning chronologically, identifying educators by their learning context (aka grade level) and learners by their self-identified role (e.g. journalist, middle-school student).

THE SPECIALIST REVIEW PHASE

The specialist review phase resembles a standard journal peer-review process. The CRS has an Editorial Review Board (ERB), of science content specialists and education/pedagogy specialists. As a resource moves into the specialist review phase, the Editor assigns it to one science ERB member and one education/pedagogy ERB member. The ERB members are responsible for obtaining two reviews on science and two on education/pedagogy, one of which can be their own review.

The final step in the review process is a test for the robustness of the digital resource, carried out by a member of the CRS staff. Although not as rigorous as the QA process undertaken by a commercial software publisher, this step seeks to ensure that the resource

Skewed Distribution of Reviews

Number of Reviews Received (sum of all types)	Number of Resources receiving this # of reviews
0	38
1	21
2-3	13
4-9	5
10-20	4
>20 (max 59)	3

Table 2.

doesn't have broken links, that the graphics print on an assortment of common printers, that the resource is operational under the most common Web browsers, and that it runs on the most common operating systems found in educational settings.

The CRS editor examines all of the information from the community, specialist, and robustness review phases, and makes a decision whether to accept the resource into the DLESE Reviewed Collection as is, request revisions from the resource creator, or decline the resource.

DISPLAY AND DISSEMINATION OF FEEDBACK/REVIEWS

When we first planned the CRS, we intended to keep all review information confidential and use the information only for editorial decisions about whether to admit resources to the DLESE Reviewed Collection. But as we gathered feedback on this plan at DLESE meetings, potential users of DLESE resources made it clear that they wanted access to the review details to help them decide whether and how to use the resource; providing a simple "yes, it's in the Reviewed Collection" or "no, it is not" was seen as a waste of valuable information. Our challenge has been to find the right balance between maintaining the confidentiality of the review process so that reviewers will speak honestly, while providing information that will be of use to potential users of the resource. Our general approach has been to withhold the identity of individual reviewers and aggregate the feedback so that individual reviewer's contributions cannot be discerned.

Each time a review is submitted, from either an educator or a learner, the review content is formatted into an automatically-generated email. The email is sent to the creator, to the CRS editorial staff, and as a blind carbon copy to the author of the review. The reviewer is not identified by name; the email comes from 'crs-editor.' A CRS staff member vets each review before the email is sent and withholds pornographic or otherwise offensive messages.

The quantitative data coming from the scoring rubrics for each of DLESE Reviewed Collection selection criteria is automatically compiled into bar graphs displayed on a webpage (figure 2, bottom). The resource creator and CRS editors have access to an expanded version of this page, on which the text that reviewers

Challenging Teaching and Learning Situations

(a)

COMMUNITY REVIEW SYSTEM Digital Library for Earth System Education (DLESE) Community Review System (CRS)

YES I USED THE RESOURCE (PAGE 3 OF 3)

DLESE is especially seeking resources that have worked well in unusual or challenging learning and teaching situations. If you use the resource with learners who have any of the following characteristics, please tell us approximately how many learners with this characteristic you worked with, and whether you would recommend the resource to other educators working with similar populations.

Characteristic of learner:	# of such learners	Would you recommend this resource for this kind of learner?		
		Strongly recommend	Weakly recommend	Advise against
Adult learners	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Color-blind	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Visually-impaired	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hearing impaired	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Place-bound, limited mobility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(b)

COMMUNITY REVIEW SYSTEM Digital Library for Earth System Education (DLESE) Community Review System (CRS)

Annotation: Challenging Learning Contexts

Title: The Global Sun/Temperature Project

ID: DLESE-000-000-001-636

Characteristic of Learner:	Number of Reviewers Who:		
	Strongly Recommend	Weakly Recommend	Advise Against
Adult Learners	3	1	0
Crises-blind	3	0	0
Blind or visually-impaired	1	2	0
Deaf or hard of hearing	5	0	0
Place-bound, limited mobility	2	0	0
Urban dweller, limited contact with Nature	4	0	0
Economically disadvantaged	11	0	0

Figure 4. Educators and learners who have used a resource for teaching or learning are asked if they or any of their learners have any characteristics which might set them apart from the average learner, for example being color-blind. If so, we ask whether they would recommend use of the resource with such learners. (upper) Part of the web-form which gathers this information. (lower) We display this information for public, resource creator, and editors as a tabulation of recommendations for and against using the resource with each population.

typed into the text boxes beneath each scoring rubric is presented chronologically beneath the bar graph. The public sees only the bar graphs.

Data coming from the second page of the reviewers' questionnaires, the page asking for "tips" for other educators or learners, are automatically compiled into a chronological list (figure 3, bottom) and displayed on a webpage. Educator/reviewers are identified by the grade-level for which they report using the resource. Learner/reviewers are identified by the self-described role in which they used the resource (e.g. high school student, journalist, interested member of public.)

Data from the final page of the reviewers' questionnaires, the page inquiring about challenging teaching and learning situations, is presented as a table

specifying how many educators and how many learners have recommended or advised against using the resource with each category of learner (figure 4, bottom). An average webpage, organized by learner-type, showcases those resources that have been recommended by more than five educators for use with learners of specific characteristics.

The specialist reviews from the science and pedagogy reviewers are emailed verbatim but anonymously to the resource creator.

At the time that a resource is accepted into the Reviewed Collection, the CRS Editor writes an "Editor's Summary," a few paragraphs summarizing the highlights of the quantitative and qualitative feedback from the community reviews plus the specialist reviews. The public can gain access to the CRS review information by three routes. First, the CRS website includes a "Read Reviews" page (<http://crs.dlese.org/annotations/>), which gives access to all four of the CRS annotation types: Teaching tips, the bar graphs tallying the rubric scores, the table of recommendations about challenging teaching and learning situation, and the editor's summary. Secondly, at the time a resource is accepted into the Reviewed Collection, we provide a snippet of html code which the resource creator can insert into the resource itself. And finally, for a resource that has been accepted into the Reviewed Collection, the return from the DLESE Discovery System includes a link to "Reviews, teaching tips, and related resources." This link provides access to all of the available annotations from the CRS and any other review pathway by which the resource has been reviewed.

We post the Teaching Tips almost immediately after they are submitted. The tallies of rubric scores and table of recommendations about challenging teaching and learning situations are made available when a resource completes the community review phase. The editor's summary is posted when a resource completes the specialist review phase and is accepted into the Reviewed Collection.

OBSERVATIONS AND REFLECTIONS

Recognizing that DLESE and the CRS are still young and under development, here are some early thoughts on how the process seems to be working so far.

(1) The community of people creating digital resources for education seem eager for some means of obtaining feedback about, and recognition for, their handiwork. From our initial invitation to 726 functioning email addresses of resource creators, eighty-one, or 11%, submitted their resources for review, which we considered to be an encouraging response. Since we began offering resource creators a chance to opt-out of the review process rather than opt-in, on one has chosen to opt-out.

(2) Usage of resources available through the CRS seems to be severely skewed. Most resources attract very few users, and a handful of resources attract many users (Table 2). These numbers must be viewed with caution, since the percentage of users who follow through and become reviewers may vary from resource to resource, depending on such things as the nature of the intended audience.

(3) Of the seven selection criteria for the DLESE Community Review System, the most difficult for resources to meet seems to be the "Inspirational/Motivational for Learners." The reviews in the community review phase consistently have lower scores for these rubrics than on other rubrics for the same resource.

(4) The two perspectives provided by the community reviewers and the specialist reviewers can be either reinforcing or in disagreement. As an example of reinforcing reviews, consider a resource that includes an opportunity for self-assessment by automatically-scored multiple-choice questions. The specialist reviewer panned the multiple-choice questions as "unnecessarily confounding and aggravating" and lacking in any way of remediating a wrong answer; the vast majority of the community reviewers reported that they simply did not use or have their students use the provided assessments (although they liked the rest of the resource). As an example of apparent disparity between community and specialist reviews, consider a resource in which students' families are involved in collecting data about the family's use of a natural resource. A specialist reviewer noted as one of the strong points of the resource that "The project is very engaging and participation by family members can certainly motivate learners," but the community reviews from educators who had used the resource in the classroom rated the resource lower on inspirational/motivational than on any other criterion. We conclude that the two-phase review process can give a more nuanced view of the strengths and weaknesses of an educational resource than would either community review or specialist review alone.

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